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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/795,918	03/08/2004	Bernhard Geiger	2003P03678US01	1824

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Siemens Corporation
Intellectual Property Department
170 Wood Avenue South
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EXAMINER	
MURDOCH, CRYSTAL A	
ART UNIT	PAPER NUMBER
2628	

SHORTENED STATUTORY PERIOD OF RESPONSE	MAIL DATE	DELIVERY MODE
3 MONTHS	03/08/2007	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

Office Action Summary	Application No.	Applicant(s)	
	10/795,918	GEIGER, BERNHARD	
	Examiner	Art Unit	
	Crystal Murdoch	2628	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *08 March 2004*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-30* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-30* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *08 March 2004* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *31 January 2005*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

I. Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) The invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

A. Claims 1-30 are rejected under 35 U.S.C. 102(e) as being anticipated by Vining et al. (US Patent Application Publication Number 2002/0193687, herein referred to as Vining.).

Regarding independent claim 1, Vining teaches a method for performing a virtual endoscopy, comprising:

- Calculating a distance map using three-dimensional (3D) data of a lumen (See Vining: ¶37, wherein the distance map is a function of the distance from the starting seed of the region growing procedure.);

- Calculating a multi-planar reconstruction (MPR) of the lumen (See Vining: ¶21, wherein a three-dimensional rendering is produced from a series of two-dimensional cross-sectional images of a selected body organ.);

- Performing a region growing on the MPR of the lumen (See Vining: ¶31, wherein the region growing is using an initial static threshold value.);

- Marking data from the region growing (See Vining: ¶36, wherein markers are specified in the volume to best approximate the object at that location.); and

- Performing a 3D rendering of the marked data from the region growing (See Vining: ¶72, wherein a three-dimensional rendering of the wire-frame model, generated by the region growing, is displayed.).

Regarding independent claim 9, Vining teaches a method for performing a virtual endoscopy, comprising:

- Calculating a distance map using three-dimensional (3D) data of a lumen (See Vining: ¶37);

- Calculating a multi-planar reconstruction (MPR) of the lumen, wherein the MPR is calculated orthogonal to the lumen at an endoscope position (See Vining: ¶21, wherein the images used to

reconstruct the volume are cross-sections and are therefore orthogonal to the lumen at every point.);

- Performing a first region growing on the MPR of the lumen at the endoscope position (See Vining: ¶31, wherein the initial threshold value is chosen to be between -1024 HU to -425 HU, which are Hounsfield attenuation factors for air. Since lumen may be filled with a substance other than tissue, segmenting the inner region of air from the lumen is an effective way to find the inner surface. See ¶43 for further explanation.);

- Calculating a minimum distance and a maximum distance from data of the first region growing using corresponding distances from the distance map (See Vining: ¶45-50, wherein the wall thickness of the tissue surrounding the lumen is incrementally calculated. The initial thickness T is set to zero, which is the minimum, and incremented according to the process of Fig. 3 until the maximum thickness of the lumen wall is determined.);

- Performing a second region growing on the MPR of the lumen for data outside the first region growing (See Vining: ¶33, wherein the new threshold values used to determine the wall thickness are used in a region growing process to re-segment the region of interest.); and

- Performing a 3D rendering of data associated with the first region growing and the second region growing (See Vining: ¶72, wherein a 3D rendering uses a color scheme to reflect variations in the wall thickness calculated.).

Regarding independent claim 28, Vining teaches a system for performing a virtual endoscopy, comprising:

- Means for calculating a distance map using three-dimensional (3D) data of a lumen (See Vining: ¶37, wherein the means for calculating the distance map is calculated by assigning values to a seed voxel out to a threshold distance.);

- Means for calculating a multi-planar reconstruction (MPR) of the lumen, wherein the MPR is calculated orthogonal to the lumen at an endoscope position (See Vining: ¶21. Since a virtual endoscope would travel through an organ parallel with the medial axis, the series of two-dimensional cross-sectional images are captured orthogonal to the lumen at every point within the organ, thus allowing a complete three-dimensional multi-planar reconstruction of the organ.);

- Means for performing a first region growing on the MPR of the lumen at the endoscope position (See Vining: ¶35, wherein the region is grown using voxels and thresholds for the entire volume of the lumen,

which would allow the virtual endoscope to be positioned anywhere within the virtual organ.);

- Means for calculating a minimum distance and a maximum distance from data of the first region growing using corresponding distances from the distance map (See Vining: ¶35, wherein the algorithm determines the maxima and minima of the voxel values within a growing region.);
- Means for performing a second region growing on the MPR of the lumen for data outside the first region growing (See Vining: ¶33, wherein the adaptive threshold values are used to re-segment the ROI using region growing to account for the varying threshold values that are present in the tissue of the lumen.); and
- Means for performing a 3D rendering of data associated with the first region growing and the second region growing (See Vining: ¶72).

Regarding independent claim 29, Vining teaches a method for performing a virtual endoscopy, comprising:

- Acquiring three-dimensional (3D) data from a lumen (See Vining: ¶21);
- Calculating a distance map using the 3D data of the lumen (See Vining: ¶37);

- Positioning an endoscope at a desired position in the lumen (See Vining: ¶71, wherein a user-controlled camera is positioned within a lumen.);

- Calculating a multi-planar reconstruction (MPR) of the lumen, wherein the MPR is calculated orthogonal to the lumen at the endoscope position (See Vining: ¶21);

- Performing a first region growing on the MPR of the lumen at the endoscope position (See Vining: ¶35);

- Marking data associated with the first region growing for rendering (See Vining: ¶36);

- Calculating a minimum distance and a maximum distance from the marked data of the first region growing using corresponding distances from the distance map (See Vining: ¶35, wherein the algorithm determines the maxima and minima of the voxel values within a growing region.);

- Performing a plurality of region growings for data outside the marked data region that is within a threshold associated with the calculation of the minimum and maximum distances of data (See Vining: ¶33, wherein re-segmenting indicates multiple region growings outside of

the initially grown region using varying threshold values present in the tissue of the lumen.);

- Marking data associated with the plurality of region growings for rendering (See Vining: ¶36, wherein the marker classifies the voxel as being inside or outside the object, which encompasses both the first and second regions.); and

- performing a 3D rendering of the marked regions associated with the first growing and the plurality of region growings (See Vining: ¶87).

Regarding claim 2, Vining teaches the method of claim 1, further comprising:

- Acquiring the 3D data from the lumen (See Vining: ¶21, wherein the method creates three-dimensional renderings of three-dimensional structures generally having a lumen.).

Regarding claim 3, Vining teaches the method of claim 2, wherein the 3D data is acquired by helical CT (See Vining: ¶21).

Regarding claim 4, Vining teaches the method of claim 1, wherein the organ with a lumen can include colons, blood vessels, and airways (See Vining: ¶21).

Regarding claim 5, Vining teaches the method of claim 1, wherein the MPR is calculated orthogonal to the lumen (See Vining: ¶21, wherein the cross-sectional slice images are orthogonal to the lumen at every point within the organ, thus the three-dimensional multi-planar reconstruction of the organ is created orthogonal to the lumen.).

Regarding claim 6, Vining teaches the method of claim 1, wherein the MPR is calculated at an endoscope position (See Vining: ¶21, wherein the organ is reconstructed from the cross-sectional images such that an endoscope could travel to any location within the lumen.).

Regarding claim 7, Vining teaches the method of claim 1, wherein the region growing is performed at the endoscope position (See Vining: ¶36, wherein the endoscope is positioned inside the lumen.).

Regarding claim 8, Vining teaches the method of claim 1, wherein the 3D rendering of the region associated with the region growing is performed using either surface rendering or volume rendering 3D rendering techniques (See Vining: ¶87).

Claims 10, 11, 14, and 15 are rejected by the same rationale applied above to claims 2-4, and 8, respectively.

Regarding claim 12, Vining teaches the method of claim 9, further comprising marking data from the first region growing to be rendered (See Vining: ¶36).

Regarding claim 13, Vining teaches the method of claim 9, further comprising marking data from the second region growing to be rendered (See Vining: ¶36, wherein the marker classifies the voxel as being inside or outside the object, which encompasses both the first and second regions.).

Regarding claim 16, Vining teaches the method of claim 9, wherein the second region growing is performed within a threshold associated with the calculated minimum and maximum distances (See Vining: ¶45-50, wherein the region is grown within the threshold of –425 HU and 100HU, which is the threshold used to determine the maximum and minimum values for the wall thickness.).

Regarding independent claims 17, the rationale used above with respect to claim 9 is incorporated herein. Vining teaches a system for implementing the method of a virtual endoscopy, comprising:

- A memory device for storing a program (See Vining: Fig. 4, Item 21 "MEMORY");

- A processor in communication with the memory device (See Vining: Fig. 4, Item 26, "GRAPHICS COMPUTER"), the processor operative with the program execute the steps of the method addressed in claim 9.

Claims 18-20 are rejected by the same rationale used in the rejection of claims 10-13, respectively, wherein claim 20 is a combination of claims 12 and 13.

Regarding claims 21 and 22, Vining teaches the system of claim 17, wherein the processor is further operative with the program code to display an image resulting from the 3D rendering of the data associated with the first region growing and the second region growing, wherein the image is displayed by a display device (See Vining: Fig. 4, Item 28, "MONITOR;" ¶22).

Claims 23-27 differ from claims 9-11 and 14-15, respectively, only in that claims 23-27 are directed towards a computer program product comprising a computer useable medium having computer program logic recorded thereon for performing the virtual endoscopy method of claims 9-11 and 14-15 respectively. Vining notes is ¶7 that the method of the disclosure is a computer-implemented method for interactively displaying a three-dimensional rendering of a structure having a lumen. The computer program logic controls the interactivity between the user and

the rendering of a structure to a display. Thus, the rationale used above in the rejections of claims 9-11 and 14-15 is applied to claims 23-27.

Regarding claim 30, Vining teaches the plurality of region growings are performed until all data outside the marked data region that is within the threshold has been subjected to at least one of the plurality of region growings (See Vining: ¶48, wherein when the thickness of a vertex is measured, it is assigned to a region for growing.).

II. Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

- US 20030099386 – Region growing in anatomical images
- US 6556696 – Detecting surface anomalies

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Crystal Murdoch whose telephone number is (571) 270-1043. The examiner can normally be reached on Mon. - Fri. 7:30a - 5:00 (off every other Fri.). If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mark Zimmerman can be reached on (571) 272-7653. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

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